

- ▶ To press the Space bar to start the format process.
- ▶ To repeat the process once the format is complete. (To exit FORMAT, press Return.)

If both floppy drives are available and you load FORMAT without drive names, you can use both drives for formatting diskettes.

While FORMAT is running, it displays the number of the track it is formatting at the bottom of the screen. (Your diskettes contain 80 tracks on a side.)

## Command Switches

A description of the command switch functions follows. Some switches display information about diskette tracks, zones, and soft errors. Tracks are circular sections of a diskette; your diskettes have 80 tracks on a side. These tracks are grouped into eight zones; the drive motor runs at a different speed on each zone. Soft errors are worn or flawed spots on the diskette that may make it unreliable for use.

- /C displays the total number of soft errors found and the amount of space available on the diskette. Use /C to gauge the reliability of a diskette for recording data. If 15 or more soft errors appear, repeat FORMAT a few times. If this number of errors persists, discard the diskette and try another.
- /D formats a double-sided diskette.
- /E displays the locations of soft errors encountered, the total number of soft errors found, and the amount of space available on the diskette. The /E switch implies the /C switch.
- /S transfers the operating system to the newly formatted diskette, creating a system diskette.

**/Z** displays disk zone information (size of tracks and gaps).

You may use **FORMAT** switches in combination. For example, the command—

**FORMAT B: /E/D**

would format both sides of the diskette in drive B and display the locations and total numbers of the soft errors encountered.

### Command Examples

The following example illustrates using **FORMAT** without parameters. Your input is boldface.

**A>format** ↵

Diskette **FORMAT** Utility-Version m.n

Format **FLOPPY** drive? (A or B; press return key to end) **b**

Format **FLOPPY** drive B. Press space bar when ready. —

Format **FLOPPY** drive B complete.

Format **FLOPPY** drive? (A or B; press return key to end) ↵

**A>**

---

The following example illustrates using **FORMAT** with the **/C**, **/S**, and drive name parameters (because **/S** is used, **FORMAT** creates a new system diskette).

**A>format b: /c/s** ↵

Diskette **FORMAT** Utility-Version m.n

System transferred

Format floppy drive B complete  
80 tracks formatted: 0 soft errors.  
620544 bytes total disk space  
48128 bytes used by system  
572416 bytes available on disk

A>

---

## The DCOPY Utility

A.5.

DCOPY copies the contents of one diskette onto another diskette, creating a literal twin of the original diskette. In the process, DCOPY formats the new diskette (eliminating the need to run FORMAT separately).

DCOPY operates only on diskettes, and may not be used on an internal hard disk system.

**NOTE:** Drive A is always the left floppy drive and drive B is the right floppy, regardless of virtual volume drive reassignments.

### Command Syntax

The command syntax for the DCOPY utility is—

**DCOPY [drivename: to drivename:] [/C][/E][/Z]**

where the first drive name is the name of the drive containing the diskette to be copied from, the second drive name is the name of the drive containing the diskette to be copied to, and /C, /E, and /Z are command switches.

### Command Operation

If you give the copy-from and copy-to drive names with the DCOPY command, DCOPY copies the designated diskette and exits to the operating system.

If you do not designate the copy-from and copy-to drive names with the DCOPY command, DCOPY prompts you—

- ▶ To type the name of the drive containing the diskette to be copied.
- ▶ To press the Space bar to start the copy process.
- ▶ To repeat the process once the copy is complete. (To exit DCOPY, press Return.)

Unless you are copying your operating system diskette, use DCOPY without drive name parameters. Otherwise, the copy process will begin before you can safely remove your system diskette and replace it with the copy-to or copy-from diskette.

After you load DCOPY without drive names, you can remove the system diskette from drive A and then use both drives for copying diskettes.

While DCOPY is running, it displays the number of the track it is copying at the bottom of the screen. (Your diskettes contain 80 tracks on a side.)

## Command Switches

You can use the /C, /E, and /Z command switches with DCOPY. These switches perform the same functions with DCOPY that they perform with FORMAT. Refer to the preceding discussion for descriptions of the command switch functions.

You may use DCOPY switches in combination. The command—

DCOPY B: TO A: /C/Z

would copy the contents of the diskette in drive B onto the diskette in drive A and display disk zone information and the total number of soft errors found.

## Command Examples

The following example illustrates using DCOPY without parameters. Your input is boldface.

A>**dcopy** ↵

Diskette COPY Utility-Version m.n

Copy from FLOPPY drive? (A or B; press return key to end) a

Copy from FLOPPY drive A to drive B. Press space bar when ready. \_

Copy from FLOPPY drive A to drive B complete.

Copy from FLOPPY drive? (A or B; press return key to end) ↵

A>

---

The following example illustrates using DCOPY with the /C and drive name parameters.

A>**dcopy a: to b: /c** ↵

Diskette COPY Utility-Version m.n

Dcopy complete.

80 tracks copied: 0 soft errors.

A>

---

## The SYSCOPY Utility

### A.5.4

The SYSCOPY utility is used to copy an operating system onto a diskette or virtual volume. You can then use the diskette or volume to load (boot) the operating system.

The operating system is copied from either an existing system diskette/volume or a file created by the system configuration process.

To boot with a virtual volume, you must select the volume as the primary boot volume in the HDSETUP utility—as well as copy the operating system onto the volume with SYSCOPY. If you copy the operating system onto the existing primary boot volume, the newly copied system will be used next time you boot from the hard disk.

## **Command Syntax**

The SYSCOPY syntax is—

**SYSCOPY** <source> [<destination>]

where source is the diskette, volume, or file that contains the operating system, and destination is the diskette or volume onto which the operating system is to be copied.

## **Command Operation**

You can specify the source in two forms: a drive specification (e.g., A:) indicates the source is an existing system diskette or volume; a file name indicates the source is the specified operating system file (created during system configuration). If you give a file name without an extension or drive letter, the system assumes the extension SYS and the default drive.

In addition to the operating system, the source drive must contain the file COMMAND.COM. This file is copied with the operating system.

Specify the destination by giving the destination drive letter and a colon only. If you specify the destination with the command, the program terminates after the copy is complete. (Because no user interaction is necessary, you can use this form in a batch command.)

If you do not specify the destination with the command, the utility prompts you for it. After you respond to the prompt, the utility displays your response for verification. After the copy is complete, you are prompted for another destination.

### Command Examples

The following example illustrates copying the operating system and COMMAND.COM from drive A to drive B. The source is the system diskette or system volume assigned to drive A.

```
A>SYSCOPY A: B: ↵
```

```
SYSCOPY-Version x.x yy.mm.dd
```

```
A>
```

---

The following example illustrates copying the operating-system MSDOS.SYS and COMMAND.COM from the diskette or hard disk volume assigned to default drive (drive C) to the diskette or hard disk volume assigned to drive B.

```
C>SYSCOPY MSDOS B: ↵
```

```
SYSCOPY-Version x.x yy.mm.dd
```

```
C>
```

---

The following example illustrates copying the operating-system file MSDOS.NEW and COMMAND.COM from the diskette or hard disk volume assigned to drive C to the diskette assigned to drive F. It also copies them to the hard disk volume (named MYVOLUME) assigned to drive B.

```
A>SYSCOPY C:MSDOS.NEW ↵
```

```
SYSCOPY-Version x.x yy.mm.dd
```

**A**

Destination drive ? ( A-F; press return to end.) F  
Copy to F: (FLOPPY). Press space bar when ready. ☐  
Copy completed.

Destination drive ? ( A-F; press return to end.) B  
Copy to B: (MYVOLUME). Press space bar when ready. ☐  
Copy completed.

Destination drive ? ( A-F; press return to end.) ↵  
A>

---

## Error Messages and Recovery

### Bad parameter on command line- <bad param>

The indicated parameter <bad param> is not correct. Correct the command and redo it. The most common parameter errors are—

- ▶ No parameter specified. <source> must be on the command.
- ▶ Invalid drive. The drive specified must be assigned.
- ▶ Bad destination. The destination specified is not a drive.
- ▶ Too many parameters. More than source and destination typed.

### Cannot Open MSDOS.SYS

The specified source drive is not a bootable diskette or volume. Specify either a bootable volume, or a source file name.

### Cannot Open <source file name>

The specified source file name cannot be opened. Make sure you typed the name correctly and that it is on disk.

## **Cannot Open COMMAND.COM**

The source drive does not have COMMAND.COM. Use the COPY command to copy COMMAND.COM from a bootable volume onto the source drive.

## **Cannot Create MSDOS.SYS**

— or —

## **Cannot Create COMMAND.COM**

There is no room left in the directory of the destination drive. Delete some files and try again.

## **No space for MSDOS.SYS**

There is no room on the disk for MSDOS.SYS (the system image). Delete some files and try again. Note that MSDOS.SYS must reside on contiguous disk space. Thus if the diskette or volume is “checker boarded” (i.e., small, noncontiguous disk spaces available) you may have to delete many files. In this case, it is probably best to start with a newly formatted diskette or a completely empty volume; first do the SYSCOPY and then use the COPY command to copy the rest of the files.

## **No space for COMMAND.COM**

There is no room on the destination disk for COMMAND.COM. Check the size of COMMAND, using the DIR command, and remove enough files from the destination drive to make room.

## **Unexpected Termination**

This explanation is applicable only if the destination drive is a hard disk volume. To prevent leaving the hard disk in an inconsistent state, when a copy is started whose destination is a hard disk volume, the system information which points to the boot image is cleared. This information is reinstated when the copy is completed. Thus, if a failure occurs during a copy to a hard disk volume (i.e., while the message “Copying...” is being displayed), you will not be able to boot from the hard disk. You will have to boot from

**A**

the floppy. This condition will be corrected after the next successful SYSCOPY or assignment in HDSETUP. It is therefore very important that you keep a copy of the hard disk operating system, with its utilities, in a safe and handy place.

---

### **A.5.5 The COPY Command**

Use the COPY command to copy files from one virtual volume onto another virtual volume or to copy files between a virtual volume and a floppy diskette.

If you have an internal hard disk system, you can also use use COPY to copy the contents of one floppy diskette onto another floppy diskette.

#### **Command Syntax**

The basic command syntax for COPY is—

**COPY <filename> <filename>**

The COPY function is to copy the first file (or files) specified onto the second file specified.

For example, the command—

**COPY A:\*. \* C:**

would copy all the files on the diskette in floppy drive A onto the virtual volume C on the hard disk.

You can also use COPY to concatenate files and to combine ASCII and binary files. Refer to Chapter 9 for a more complete description of how to use COPY.

#### **Copying Diskettes With An Internal Hard Disk**

With an internal hard disk, copying one floppy diskette onto another requires use of the hard disk.

To copy a diskette—

1. Create a volume on the hard disk with characteristics similar to the floppy diskette—using 1217K of storage and 2K allocation units. (If you are using single-sided diskettes, use 662K storage and 2K allocation units.)
2. Use COPY to transfer files onto the hard disk volume you just created.
3. Insert the target diskette (it must contain an operating system) into the floppy drive.
4. Use COPY again to transfer the files onto the second diskette.

---

## CP/M-86 OPERATIONS

A.6

The CP/M-86 emulator runs CP/M-86 programs under MS-DOS. The emulator supports the commonly used CP/M-86 functions and provides a CP/M-86 environment for the program. The program is executed as under CP/M-86; recompilation, reassembly, or other translation is not necessary.

Operations describes how to use the emulator to run CP/M-86 programs on the hard disk (under MS-DOS). It also describes the emulator program characteristics.

---

### Emulator Operation

A.6.1

To run a CP/M-86 program on the hard disk—

1. Transfer the CP/M-86 files onto an MS-DOS diskette, using RDCPM. (RDCPM is described in Chapter 8.)
2. Type—

**cpm**

followed by a space, the CP/M-86 command line (exactly as you would type it under CP/M-86), and a Return.

---

## A.6.2 Emulator Description

The emulator is partitioned into modules, each of which handles a set of the CP/M-86 BDOS functions. These are—

- ▶ Emulator initialization
- ▶ Program loader
- ▶ Memory management
- ▶ Run time interface
- ▶ File system interface
- ▶ Byte oriented device interface
- ▶ System functions

### Emulator Initialization

The emulator is loaded and resides at high memory. Thus the TPA, as seen by the emulated program, corresponds to the CP/M-86 environment.

The input command line is formatted according to CP/M-86 CCP conventions. The specified program is loaded, the base page is initialized, and control is turned over to the program.

### Program Loader

The CP/M-86 program loader is fully emulated. All three memory models are supported.

### Memory Management

Memory management functions are fully emulated. However, functions implied by CCP artifacts, such as “system reset” and “stay resident”, are not supported.

The memory functions emulated are:

- ▶ Get maximum available memory
- ▶ Get maximum memory, absolute
- ▶ Get memory region
- ▶ Get absolute memory region
- ▶ Free memory
- ▶ Free all memory

## Run Time Interface

The run time interface module handles the CP/M-86 BDOS interrupt and dispatches the appropriate routine. The emulator provides a stack, internal to the emulator, distinct from the program's init stack.

## File System Interface

The standard CP/M-86 FCB is used for all emulations, and the CP/M-86 requests are mapped into corresponding MS-DOS requests. All user-accessible FCB data is maintained by the emulator identically to CP/M-86.

The system FCB data space is reserved, but the information in it is not valid. Because of the lack of sparse files under MS-DOS, programs that use certain random write techniques may require more disk space.

Directory maintenance is functionally compatible. Maintenance functions provide a directory block with the index and all fields except the name and extent cleared to zero. The remainder of the directory block contains inactive entries.

Two CP/M-86 functions cannot be supported because they use CP/M-86 directory information. These functions are "set file attribute" and search with "?" drive.

These file system interface functions are supported:

- ▶ Open/Make
- ▶ Close
- ▶ Read sequential
- ▶ Write sequential
- ▶ Read random
- ▶ Write random
- ▶ Set random record
- ▶ Write random with zero fill
- ▶ Search first/next (with exception described above)
- ▶ Delete
- ▶ Rename
- ▶ File size

## **Byte Oriented Device Interface**

Byte oriented logical devices are fully supported, including redirection via the I/O byte.

These functions are supported:

- ▶ Console input
- ▶ Console output
- ▶ Reader input
- ▶ Punch output
- ▶ List output
- ▶ Direct console I/O
- ▶ Print string
- ▶ Read console buffer
- ▶ Get console status

## System Functions

These system functions are supported:

- ▶ System reset (terminates emulation; does not allow program to remain resident).
- ▶ Return version number.
- ▶ Reset disk system (MS-DOS disk reset).
- ▶ Select disk (uses MS-DOS function).
- ▶ Return login vector (reflects all drives known to MS-DOS).
- ▶ Return current disk (CP/M-86 equivalent).
- ▶ Get DMA address (CP/M-86 equivalent).
- ▶ Write protect disk (marks disk as write protected within the emulator).
- ▶ Get address (R/O vector; returns address of the emulator R/O vector).
- ▶ Reset drive (resets emulator R/O vector).
- ▶ Get/Set DMA base (CP/M-86 equivalent).

Direct BIOS calls that are supported are as follows:

- ▶ INIT (terminates emulation)
- ▶ WBOOT (terminates emulation)
- ▶ CONST, CONIN, CONOUT
- ▶ LIST, LISTST, PUNCH, READER
- ▶ HOME, SELDSK
- ▶ GET/SET IO BYTE

The system functions NOT supported include the following:

- ▶ Get address (allocate)
- ▶ Get/Set user code

These direct BIOS calls are NOT supported:

- ▶ SETTRK, SETSEC, SETDMA
- ▶ READ, WRITE, SECTTRAN
- ▶ SETDMA, SETDMAB, GETSEGB

If you attempt to use these functions, an error message is displayed, and the program terminates.

---

## **A.7 EXTERNAL HARD DISK INSTALLATION PROCEDURES**

---

### **A.7.1 Introduction**

The external hard disk subsystem connects to the computer via a single round cable. The standard cable is 60 cm. long. This allows you to position the disk on either side of the computer. An extender cable is available to place the disk up to three meters away.

The hard disk subsystem may have one or two panel mounted connectors. One connector mates with the cable from the computer. The other is used to connect an optional second disk subsystem.

---

### **A.7.2 External Hard Disk Installation**

Each disk subsystem requires an AC power cable. The data connectors, the AC power receptacle, and power switch are on the rear panel.

Follow these steps to install the hard disk:

1. Disconnect the power.
2. Remove the rear panel and cover of the mainframe host unit.
3. Disconnect the DC power cables, the CPU, and the disk controller board.

4. Loosen the 4 power supply mounting screws and the support bracket screw.
5. Remove the power supply.
6. Remove the 4 fan mounting screws.
7. Feed the data cable (of the connector panel assembly, p/n 101845-01) through the auxiliary port in the switch plate (p/n 100727-01). Position the data cable so that the connector panel (p/n 101842-01) is placed between the fan and the switch plate.
8. Reinstall the fan using the 4 screws (p/n 100236-06) provided with the kit. Air flow (noted by the arrow on the fan) should be outward.
9. Reinstall the power supply.
10. Connect the 50-conductor cable (from the connector panel assembly) to header connector J1 on the DMA board (p/n 101160-01). Check that the pin numbers correspond.
11. Insert the DMA board into any of the four expansion slots on the CPU board **WITH COMPONENT SIDE FACING OUTWARD**.
12. Position the expansion retainer (p/n 100891-01) on the top edge of the DMA board and clip it to the disk chassis (p/n 100662-01).
13. Check that fasteners and connectors are tight.
14. Close the mainframe host unit.

---

## A.8 TECHNICAL FEATURES

Technically, the main features of the hard disk include—

- ▶ 10.6Mbyte formatted capacity (12.75Mbyte unformatted)
- ▶ Intelligent disk controller
- ▶ Direct Memory Access (DMA) interface to system memory
- ▶ User configurability

The DMA interface permits rapid data transfer from disk to system memory in parallel with CPU operations. The DMA interface board occupies a single slot on your expansion bus.

To reduce seek time, the heads of the disk drive are moved according to an optimum positioning algorithm. The algorithm is implemented on the disk drive by its own microprocessor.

The microprocessor-based intelligent disk controller relieves the host processor of low-level control over disk activity.

Disk controller features include—

- ▶ Automatic data error detection and correction: Burst errors up to 22 bits in length can be detected and errors up to 11 bits can be corrected.
- ▶ Multisector transfers: The host may request data transfers of almost any length, and the controller will perform automatic head and cylinder switching as necessary.

# CHARACTER SETS Appendix C

## C-1: International Character Set

LOW NIBBLE	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0:	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
1:	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
2:	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
3:	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
4:	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
5:	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
6:	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
7:	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
8:	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
9:	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
A:	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
B:	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
C:	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
D:	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
E:	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
F:	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F

## C-2: British Standard Character Set

LOW NIBBLE	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0:	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
1:	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
2:	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
3:	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
4:	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
5:	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
6:	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
7:	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
8:	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
9:	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
A:	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
B:	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
C:	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
D:	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
E:	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
F:	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F

### C-3: French Standard Character Set

[illegible]

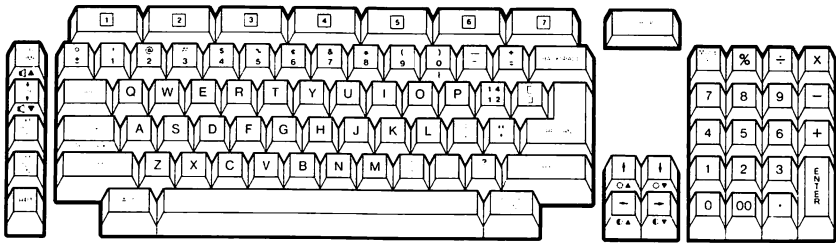
#### C-4: German Standard Character Set

[illegible]

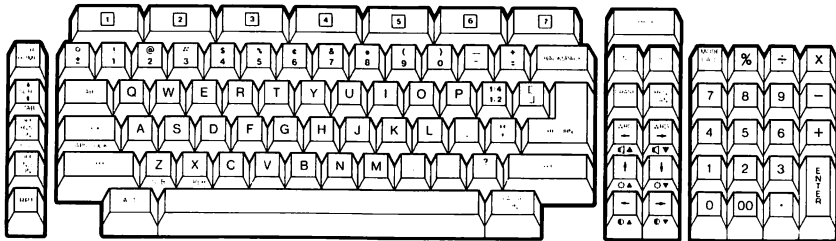
# Appendix D

## KEYBOARDS

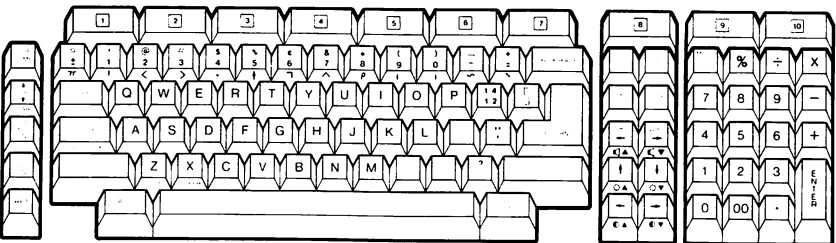
### D-1: Standard Keyboard



### D-2: Word Processing Keyboard

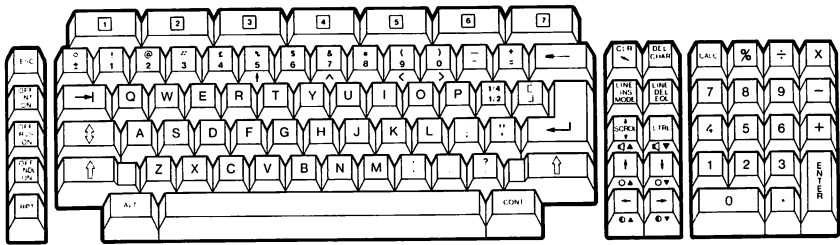


### D-3: Programming Keyboard

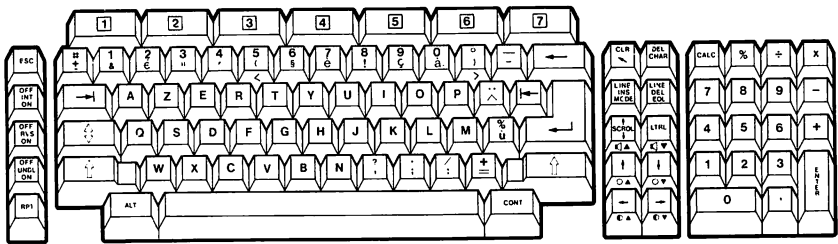


# KEYBOARDS

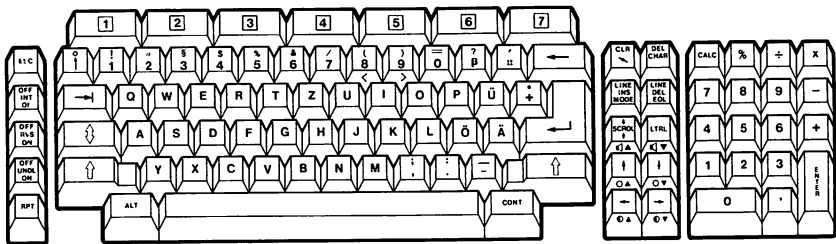
## D-4: British Keyboard



## D-5: French Keyboard



## D-6: German Keyboard



# Appendix E

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## PERIPHERALS

This appendix gives you an idea of the range of peripherals available for use with your computer. Contact your dealer for details on these and other options.

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### PROGRAMMER'S TOOL KIT

E.1

The Programmer's Tool Kit is a package of utilities designed for applications and systems programmers. All of the utilities run under the MS-DOS operating system.

---

#### Volume I

E.1.1

- ▶ **FABS/86:** A module that uses key files for fast data retrieval. FABS/86 organizes the key files in balanced trees (Btrees), eliminating the need to search the entire data file each time you want to retrieve a piece of information.
- ▶ **AUTOSORT/86:** A sort/merge/select utility that helps you sort very large files that contain fixed-length fields within fixed-length records. AUTOSORT/86 can be used by itself or it can be called as a subroutine from application programs.
- ▶ **PMATE-86:** A full-screen, expandable editing system that combines the best features of text editors, word processors and text output processors. PMATE-86 lets you create and maintain text files, and is very useful for editing programs.
- ▶ **EFONT:** A font editor used to create or modify the characters that appear on the screen. With EFONT, you can make changes to an existing character set or you can create a new one to use in a special application.

E

- ▶ **KEYGEN:** A utility that lets you take advantage of your computer's "soft" keyboard. KEYGEN is used to define and change the functions performed by individual keys.
- ▶ **MODCON:** A utility you can use to modify the configuration of your operating system. With MODCON, you can choose the keyboard and character set tables that you want to use.

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## E.1.2 Volume II

- ▶ **MS-CREF:** A cross-reference utility that helps you debug assembly language programs. MS-CREF produces an alphabetical listing of all symbols used in a program, making it easy to locate the program line number where a particular symbol occurs. MS-CREF can be used with the MACRO-86 macro assembler.
- ▶ **MS-LINK:** A relocatable linker that links together separately produced modules of 8086/8088 object code. The code can be generated from MACRO-86 or any of the Microsoft compilers. MS-LINK is user-friendly. It prompts you each time a command needs to be issued; your answers to the prompts are the commands.
- ▶ **MS-LIB:** Creates and modifies library files used by MS-LINK. MS-LIB adds, deletes or extracts modules from a library. It can create a general library used by many programs or for the structured development of a single program.
- ▶ **DEBUG:** A debugging program that provides a controlled testing environment for binary and executable object files. DEBUG eliminates the need to reassemble a program to see if you can fix a problem by making a minor change.
- ▶ **MACRO-86:** A powerful assembler for 8086/8088-based computers. MACRO-86 has many features usually found only in large computer assemblers. Macro assembly, conditional assembly, and a variety of assembler directives give you the tools

you need to get full use and power from an 8086/8088 micro-processor.

- ▶ **SYSELECT:** A system generation program that lets you create a custom operating system. SYSELECT lets you customize keyboard tables, character sets, default printer types, serial port specifications, logos, and banners.

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## GRAPHICS TOOL KIT

E.2

The Graphics Tool Kit is a package of utilities that help you create screen graphics for special purposes. The Tool Kit includes:

- ▶ **BUSIGRAF:** A business graphics package that lets you create and edit pie charts, bar graphs, line plots, and organization charts.
- ▶ **GRAFIX:** A powerful set of programming commands that help you create screen graphics. With GRAFIX, you can draw different types of lines, circles and arcs, fill in areas and bars (and choose the fill-in pattern), and many other functions.
- ▶ **CHARGRAF:** A character graphics system that lets you create and print graphics with characters instead of high-resolution graphics.
- ▶ **EFONT:** A font editor used to create or modify the characters that appear on the screen. With EFONT, you can make changes to an existing character set or you can create a new one to use in a special application.
- ▶ **KEYGEN:** A utility that lets you take advantage of your computer's "soft" keyboard. KEYGEN is used to define and change the functions performed by individual keys.
- ▶ **MODCON:** A utility you can use to modify the configuration of your operating system. With MODCON, you can choose the keyboard and character set tables that you want to use.

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- ▶ **GW BASIC:** An interactive interpreter that supports music and high-resolution graphics.

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## COMMUNICATIONS

E.3

With these packages, your computer can communicate with and control external devices and other computers, including the IBM Personal Computer. Current communications packages include:

- ▶ **IEEE 488:** A parallel communications interface used for device communication and control. You can use IEEE 488 to communicate with devices such as data acquisition and control products, measurement devices, plotters, and printers. These devices must conform to ANSI Standard MC1.1 "Digital interface for programmable instrumentation."
- ▶ **PC COMM:** This package lets your computer communicate with the IBM Personal Computer (PC). PC COMM lets you transmit source and object files from the IBM PC to your computer with an effective transfer rate of about 1000 bytes per second. PC COMM can be used without purchasing additional hardware for the IBM PC.
- ▶ **ASYNCR:** This package lets your computer communicate with other computers. ASYNCR lets you log on to a remote timesharing computer or transfer files between computers over hard wires or the telephone.
- ▶ **BISYNCR-86/3780:** A communications protocol emulator that runs on your computer under the CP/M-86 operating system. BISYNCR-86/3780 allows communication using IBM 2770, 2780, 3741 or 3780 protocol, and provides for microcomputer-to-microcomputer communications mode. You use your computer as a Remote Job Entry terminal connected to a main-frame computer by telephone.

The audio package lets you record, edit, permanently store, and play back sounds. Using a CODEC, human voice or other sounds are recorded and recalled. You can use the audio package for voice prompts, error or help messages, voice confirmation of data entered on the keyboard, and electronic voice messaging.

## GLOSSARY

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**Allocation unit:** The “building blocks” used to create files on the hard disk. An allocation unit can contain 1K, 2K, 4K, 8K, 16K, 32K, or 64K bytes. You select an allocation unit size for each hard disk volume when you set up the hard disk.

**ALT key character:** The letter or number key used with the ALT key to perform an ALT-key function.

**ALT-key function:** A function performed by holding down the ALT key and pressing another key. The ALT-key function for some keys is shown on the front key label.

**Ambiguous:** Used to describe a file specifier that contains wild-card characters.

**Application program:** A program that performs specific tasks, such as word processing or payroll accounting. The term “application” refers to the fact that the program applies the computer to a particular task.

**AU:** Allocation unit.

**Backup:** The act of creating a backup diskette.

**Backup or backup diskette:** A duplicate diskette. You should routinely create backups to ensure against diskette or hard disk damage with resulting data loss.

**Boot:** See “load.”

**Boot volume:** See “primary boot volume.”

**Calculator field:** A space on the screen where the computer displays calculations as they are performed by the CALC utility.

**Calculator keys:** The group of keys on the right of the keyboard, arranged like a calculator.

**Character:** A letter, number, or symbol.

**Command:** What you type at the keyboard to tell the computer what to do. The program you are using must contain the command in its “vocabulary” for the command to work. Commands may consist of words, parts of words, or codes.

**Command line:** A command and its parameters.

**Command parameter:** A word or group of characters that you type with the command to change the effect of the command.

**Command prompt:** A program’s signal that requests a command from you. The DOS command prompt is a letter followed by > (for example, A>).

**Command switch:** A certain type of command line parameter you can use with some utilities. Each utility has its own command switches.

**CP/M-86:** One of the operating systems used with the computer.

**CRT:** The display unit. CRT stands for “cathode ray tube.”

**Cursor:** A rectangular marker displayed on the screen to show where your next typed entry will appear.

**Data:** Information.

**Default drive:** The floppy disk drive or hard disk volume you are now using. The default drive is shown in the DOS command prompt.

**Default value:** The assumed value. The computer assumes a default value unless you specify another value.

**Directory:** See “file directory.”

**Disk operating system:** See “operating system.”

**Diskette:** See “floppy diskette.”

**Display Unit:** One of the three main computer units. The display unit contains the TV-like screen. The screen displays both what you type and the computer’s messages to you.

**DOS:** The operating system. DOS stands for “disk operating system.”

**Double-sided diskette:** A floppy diskette that can record information on both sides.

**Double-sided drive:** A floppy disk drive that can be used with single-sided or double-sided diskettes.

**Drive:** (1) A floppy disk drive. (2) In general, a floppy disk drive or a hard disk volume. Floppy disk drives and hard disk volumes are both identified with a drive designation.

**Drive designation:** A one-letter/colon code that identifies a floppy disk drive or hard disk volume. A drive designation is an optional part of a file specifier.

**Drive door:** The latched door guarding a floppy disk drive.

**Error message:** A message that the computer displays to notify you of a problem.

**Error code:** A 2-digit code shown with some error messages.

**External DOS command:** A command which must be loaded from disk before execution.

**File:** A named collection of letters, numbers, symbols, or programming code recorded on a diskette or hard disk volume.

**File directory:** A list of the files on a diskette or volume. Operating systems and application programs maintain a directory for each diskette or volume. The DOS updates the directory when files are recorded or erased.

**File extension:** An optional part of a file specifier that contains up to 3 characters and is preceded by a period (.). An extension generally identifies the file type. Some file extensions are defined by the DOS. For example, MS-DOS uses the extension .COM for files that contain DOS commands.

**File name:** A name you (or another user) give to a computer file. A file name contains up to 8 characters.

**Floppy diskette:** A circular sheet of magnetically coated flexible plastic enclosed in a firm, square jacket. Diskettes are used for storing data.


**Floppy disk drive:** A motor-driven component of the processor unit used to record data on or retrieve data from diskettes.

**Format:** To prepare a diskette to accept data so that you can record information on it.

**Function key:** A key that performs a function, usually defined by the program you are using. The **general function keys** are the top row of typewriter keys. The **specific function keys** are the double-key column between the typewriter keys and the calculator keys, and the single-key column on the far left of the keyboard.

**General function key:** See "function key."

**Hard disk:** An optional part of the computer used to store programs and data. Hard disks come in two models: internal and external. An internal hard disk is contained in the processor unit. An external hard disk is attached to the processor unit with its own power cord.




**Hardware:** The physical parts of the computer.

**Internal DOS command:** A DOS command that is resident in memory at all times (e.g., DIR) as opposed to a command which must be loaded from disk, such as CHKDSK.

**In-use light:** A red light located by each floppy disk drive. The in-use light lights up each time the computer reads from or writes to the diskette in the drive. An in-use light also lights up when you turn on the power, indicating the drive into which you should insert the system diskette. (An in-use light is actually a light-emitting diode, or L.E.D.)

**Keyboard:** The computer's separate typewriter-style device on which you type commands and data.

**Load:** To transfer a program from a diskette or hard disk volume into the processor unit memory so that you can work with the program.



**Logged drive:** Default drive.

**Memory:** The computer's electronic storage area, containing programs and data ready for use by the computer.

**Memory test message:** The display shown while the computer checks the processor memory prior to loading the DOS. The message is a clock symbol (asking you to wait), the letter M, and a number. The number indicates memory size.

**MS-DOS:** One of the operating systems used with the computer.

**Operating system:** A program that manages the basic operations used by all programs. Examples of operating systems are CP/M-86 and MS-DOS.

**Power-on message:** The diskette-shaped symbol and flashing arrow shown when you turn on the power. The message tells you the computer is ready for you to insert a diskette.

**Primary boot volume:** The hard disk volume that you use to load the DOS.

**Processor unit:** One of the three main parts of the computer. The processor unit contains the floppy disk drives and the central processing unit (CPU), the “brains” of the computer.

**Program:** A set of instructions for a computer. Programs tell the computer how to do specific tasks.

**Read:** To retrieve data from a diskette. The computer can read programs and data files.

**Reset:** The act of pressing the reset button.

**Reset button:** The square button on the rear of the processor unit. When you press the reset button, the computer abandons the current file and/or program and tries to reload the DOS. If the DOS is not available to the computer, it displays the power on message.

**Sign-on message:** Identifying information the computer displays when a program is loaded.

**Single-sided diskette:** A diskette that can record information on one side only.

**Single-sided drive:** A floppy disk drive that can read or write only on a single side of a diskette.

**Soft error:** An error which may be caused by a worn or flawed section of a diskette or hard disk. You can check the number of soft errors on a diskette with FORMAT or DCOPY. Diskettes that contain over 20 soft errors are unreliable and should be discarded.

**Software:** Computer programs.

**Specific function key:** See “function key.”

**System diskette:** A diskette containing an operating system.

**Track:** A circular section of a diskette. A diskette contains 80 tracks on a side.

**Typewriter keys:** The main group of keys on the keyboard, arranged like a typewriter.

**Utility:** A program that is provided with an operating system and is used to help manage certain basic computer operations (such as FORMAT).

**Volume:** A section of the hard disk storage area. You use a hard disk volume much like you use a floppy disk drive that contains a diskette.

**Write:** To record or store data or programs on a diskette.

**Write-protect:** To protect a diskette, preventing the computer from writing over recorded data on it.

**Write-protect notch:** A notch on a diskette that you can cover with an adhesive tab to write-protect the diskette.

**Zone:** A group of diskette tracks. The drive motor runs at a different speed in each zone.